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STATE OF WASHINGTON

Dixy Lee Ray
Governor

DEPARTMENT OF ECOLOGY

7272 Cleanwater Lane, Olympia, Washington 98504 206/753-2353

MEMORANDUM
August 3, 1979

To: Jim Oberlander

From: John Bernhardt JB.

Subject: Hylebos Waterway Water Quality Survey, June 11, 1979

INTRODUCTION

Dunlop Towing Company is seeking approval to construct a beach ramp for its log-landling operation on the south bank of Hylebos Waterway (Figure 1). As part of the environmental impact review relating to this project proposal, the DOE Southwest Regional Office requested a survey to determine existing water quality conditions in the waterway. The survey was conducted on June 11, 1979. In attendance were John Bernhardt and Jim Oberlander (DOE) and Dick Gilmer and Kevin Folley (City of Tacoma).

METHODS

Surface water samples were collected during low-slack tide (-2.6 feet) at 10 stations. Five stations were spaced at intervals along the three-mile long waterway; four were established in the turning basin at the inner end, and Hylebos Creek was sampled at the old Highway 99 crossing about 1.8 miles above its mouth (Figure 1).

Four water quality characteristics were measured in situ: Temperature (°C); Specific conductance (µmhos/cm); salinity (g/l); and secchi disc (all white disc). Water samples were collected at each marine station, packed in ice, and transported to the DOE analytical laboratory in Tumwater for 11 analyses:

1. Dissolved oxygen (mg/l)
2. Turbidity (mg/l)
3. Fecal Coliform (col/100 ml)
4. Nitrate-N (mg/l)
5. Nitrite-N (mg/l)
6. Ammonia-N (mg/l)
7. Total Orthophosphate-P (mg/l)
8. Total Phosphate-P (mg/l)
9. Total Volatile Solids (mg/l)
10. Pearl Benson Index
11. Tannin and Lignins (mg/l)

All of the parameters were the same for the Hylebos Creek station with the exception that salinity was not measured.

All of the laboratory analyses were performed as per *Standard Methods for the Examination of Waters and Wastewaters* (American Public Health Assn., *et al.*, 1976).

RESULTS

The sampling results are presented in Table 1. For reference, the state water quality standards for Class B waters are given in Figure 2. Noteworthy observations are discussed as follows:

General Parameters

Water temperatures were similar at all stations in the waterway with the inner stations slightly higher than the outer stations. Specific conductance and salinity were slightly lower at the mouth of the waterway than inside, apparently due to the influence of Puyallup River waters which are known to circulate in a counter-clockwise pattern upon entering Commencement Bay. Salinities were fairly low throughout the waterway which would be expected during low tide when the influence of Hylebos Creek and other freshwater sources is greatest. High dissolved oxygen levels were observed throughout the waterway.

The secchi disc readings (2.2 to 4.6 feet) indicated relatively poor water visibility in the waterway. However, the turbidity levels were low (4 to 9 mg/l). The poor visibility appeared to be due to discoloration in the waters caused by factors other than the suspended and colloidal matter that give turbidity readings. Turbidity is a measure of suspended particles such as silt, clay, organic matter, plankton, and microscopic organisms in water which are usually held in suspension by turbulent flow and Brownian movement.

Dissolved oxygen and turbidity, the two general parameters measured in Hylebos Creek, were well within acceptable limits.

Bacteriological

According to the state's water quality standards, "fecal coliform organisms shall not exceed a medium value of 100 organisms/100 ml, with not more than 10 percent of the samples exceeding 200 organisms per 100 ml." Fecal coliform levels appeared to be within this standard for all of the waterway except for two of the stations (7 and 8) in the turning basin (Table 1). Hylebos Creek appeared to be the principal reason for the high counts at these stations. This contamination probably is due to coliforms emanating from cattle areas and other non-point sources (homes, etc.) known to exist upstream (Jim Oberlander, personal communication).

Nutrients

Nutrient levels were generally low throughout the waterway with some enrichment (not excessive) evident in the turning basin. The principal source appeared to be Hylebos Creek which contained moderately high amounts of nitrate-nitrogen (0.59 mg/l) and orthophosphates (0.14 mg/l). The latter is the form of phosphate readily available for uptake by plants. The algal bloom potentials (approximate point where sufficient amounts are available if conditions are right for a bloom) for these two parameters are 0.3 mg/l and 0.01 mg/l, respectively. Even with a high nutrient content Hylebos Creek waters would not be expected to significantly influence productivity in the waterway. Southern Puget Sound waters naturally have sufficient nutrients for algal blooms to occur if climatic conditions are right.

Pearl Benson Index, Tannin and Lignin

The pearl benson Index (PBI) was low at all stations except station 1 (at mouth near Pier 25) where a moderate increase was observed. This increase would be expected since Saint Regis, Inc. pulp mill and associated operations are situated along Commencement Bay a short distance west of the waterway. Any wastewaters discharged from this complex would be carried by the mouth of Hylebos waterway by prevailing currents.

Tannin and lignins were somewhat higher in the inner waterway than outer, but considered low for all of the areas sampled.

REVIEW OF OTHER DATA

The Department of Ecology has one routine water quality monitoring station on Hylebos Creek - station CMB016, located at the East 11th Street Bridge. The period of record extends from 1973 to 1977 at which time the station was discontinued. The ambient monitoring data for this station are not directly comparable to the current survey (station 2) due to variability in tidal stage, freshwater input, and climatological conditions. However, general review of the 1977-78 data for the same time of year as the current sampling (mid-June) indicates no appreciable change (Table 2).

During 1978, sediments in Hylebos Waterway were sampled as part of the federal MESA Puget Sound Project. A preliminary report on this effort states "the Hylebos sample contains several highly chlorinated compounds -- they appear to be byproducts of a manufacturing process. Based on electron-capture GC, the Hylebos sample contains 25 chlorinated compounds at concentrations of about 30 ppb and a total of about 100 chlorinated compounds (all in addition to the chlorinated byphenyls). Reference spectra are not available for identification of most of these compounds; however, W. Shackelford, Environmental Research Laboratory,

Athens, Ga., is cooperating to help identify these compounds using the best available mass spectral matching programs. These compounds would possibly be adsorbed by biota somewhat like PCB's. Many highly chlorinated compounds are quite toxic." A July 23, 1979 call to MESA indicated they have not developed any new information since that cited above. They plan further work in Hylebos.

The MESA report further states "the samples from Elliott Bay, Sinclair, and Hylebos contain the highest concentrations of extractable materials and high concentrations of polynuclear aromatic hydrocarbons, e.g., some of these samples contain about 7 micrograms per gram (ppm) benzo (a) pyrene, a carcinogen. These samples contain many aromatic hydrocarbons. Some of the aromatic hydrocarbons have been shown to bioconcentrate as much as 1700 times in some flatfish." Clearly, Hylebos Waterway has problems due to toxic chemicals.

The Army Corps of Engineers is in the planning stages for a major study (contracted to URS Company) in Commencement Bay. This study will evaluate current water quality conditions, land-use practices (present, proposed, and planned for the future), and socio-economics of the bay area. It is intended to provide a baseline of data for the EIS process that will take place when new projects come up. Hylebos Waterway will be an important part of the study. Sampling will be conducted during two seasons, winter and summer. A range of parameters will be included, such as: D.O.; salinity; bacteria; pH; sulfides; metals (Cu, Zn, Cr, Cd, Pb, etc.); and PCB's, etc.

CONCLUSIONS AND RECOMMENDATIONS

Water quality conditions in Hylebos Waterway appear to generally meet the state's Class B standards for marine waters. Further, it does not appear that there have been any dramatic changes in the water quality over the last few years.

Hylebos Waterway and the adjacent Blair Waterway are planned for further industrial development in addition to the Dunlop ramp. The following information is necessary to ensure that these waters are afforded maximum protection as the waterway develops in the future.

1. Additional baseline water quality data should be collected during worst-case conditions (summer months and storm events). Several runs required. Sampling should be conducted during both high and low tide stages because different influences may come into play during each period.

2. Sediment samples need to be collected at selected sites within the waterway to determine whether or not waste materials associated with the various industries have accumulated.

It is apparent that considerable water quality monitoring activities (MESA and Army Corps of Engineers) are planned for Hylebos Waterway and Commencement Bay in general. It also is evident that we need additional data. As a first step toward obtaining the data that we need, we should coordinate closely with MESA and the Corps during the planning of their projects. Their sampling effort should provide us with much of the information we need to evaluate conditions in the waterway.

JB:cp

Attachments

cc: Greg Sorlie
Dick Cunningham

LITERATURE CITED

Standard Methods for the Examination of Waters and Wastewaters, 1976. American Public Health Assn., Wash. D.C., 14th Edition.

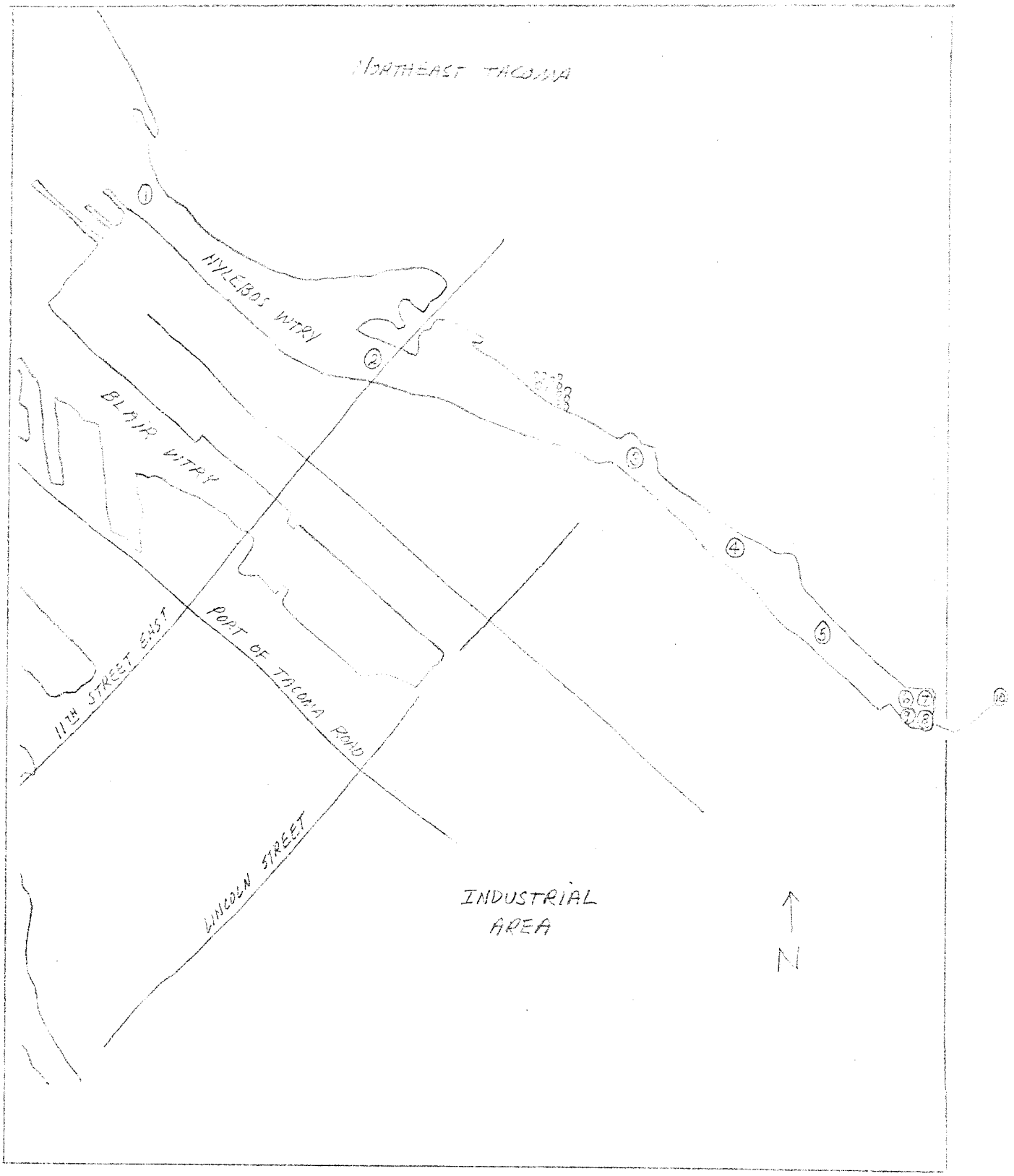

Figure 1. Schematic showing Hylebos Waterway and locations of stations sampled by DOE during June 11, 1979 survey.

Table 1. Summary of Water Quality Data Collected during DOE Survey of Hylebos Waterway, June 11, 1979.

Station	Description	Time of Day	Temp. (°C)	S. Cond. (μmhos/cm)	Salinity (g/l)	D.O. (mg/l)	Secchi (feet)	Turbidity (NTU)	Fecal Coli. (Col/100 ml)	Nitrate-N (mg/l)
1	At mouth near Pier 25	1242	15.0	18.2	14.3	11.3	3'6"	6	<10	<.01
2	East 11th St. Bridge - 0.8 mile into waterway	1235	15.9	23.1	17.9	10.7	4'2"	4	20 (est.)	<.01
3	Lincoln Ave. - 1.7 miles into waterway	1230	15.5	27.0	21.0	11.4	4'5"	5	<10	<.01
4	Near Pennwalt - 2.0 miles into waterway	1225	16.0	25.8	19.6	11.9	4'6"	6	<10	<.01
5	Near General Metals - 2.3 miles into waterway	1220	16.9	24.3	18.0	12.1	4'0"	5	30 (est.)	<.01
6	Turning basin at end of waterway - north corner	1215	16.3	23.7	17.8	12.2	4'0"	5	30 (est.)	<.01
7	Turning basin at end of waterway - east corner	1152	17.7	22.6	15.7	12.9	4'0"	7	240	.14
8	Turning basin at end of waterway - south corner	1205	19.5	22.1	16.2	10.6	2'2"	8	240	.12
9	Turning basin at end of waterway - west corner	1210	17.1	23.1	17.4	11.8	3'8"	5	40 (est.)	<.01
10	Hylebos Creek at Highway 99 - 1.8 miles above mouth	1500	----	----	----	9.0	----	9	280	.59

Station	Description	Time of Day	Nitrite-N (mg/l)	Ammonia-N (mg/l)	Total Ortho-Phosphate-P (mg/l)	Total Phosphate-P (mg/l)	Total Vol. Solids (mg/l)	PBI	Tannins and Lignins (mg/l)
1	At mouth near Pier 25	1242	<.01	<.01	.03	.05	----	41	.52
2	East 11th St. Bridge - 0.8 mile into waterway	1235	<.01	<.01	.03	.07	----	14	.66
3	Lincoln Ave. - 1.7 miles into waterway	1230	<.01	<.01	.03	.09	----	14	.74
4	Near Pennwalt - 2.0 miles into waterway	1225	<.01	<.01	.02	.09	----	14	.72
5	Near General Metals - 2.3 miles into waterway	1220	<.01	<.01	.03	.09	----	14	.86
6	Turning basin at end of waterway - north corner	1215	<.01	<.01	.03	.10	----	9	.94
7	Turning basin at end of waterway - east corner	1152	<.01	.19	.06	.20	11.6	14	1.2
8	Turning basin at end of waterway - south corner	1205	<.01	.17	.08	.21	----	14	1.2
9	Turning basin at end of waterway - west corner	1210	<.01	<.01	.04	.14	----	9	.98
10	Hylebos Creek at Highway 99 - 1.8 miles above mouth	1500	.01	.05	.14	.21	----	9	.54

Table 2

DEPARTMENT OF ECOLOGY

PUGET SOUND BASIN RETRIEVAL --- 780602

OFFICE OF WATER PROGRAMS
WATER QUALITY MANAGEMENT DIVISION
WATER & WASTEWATER MONITORING SECTION

CMB016 COMMENCEMENT BAY-HYLEBOS-11TH ST

STORET MINOR BASIN: PUGET SOUND STORET SUB BASIN: PUYALLUP-WHITE

LATITUDE: 47 16 39.0 ELEVATION (FEET): 0 WATER CLASS: 8
LONGITUDE: 122 23 35.0 COUNTY: 53 SEGMENT: 05-10-01

AGENCY: 21540000 STATE: WASHINGTON STA TYPE: MARINE

TERMINAL STREAM	1ST LEV MILES	2ND LEV MILES	3RD LEV MILES	4TH LEV MILES	5TH LEV MILES	6TH LEV MILES

DATE FROM TO	TIME	DEPTH FEET	00010 WATER TEMP DEG-C	00300 DISSOLVED OXYGEN MG/L	31504 TOTAL COLIFORM /100ML MF	31616 FECAL COLIFORM /100ML MF	00400 pH STANDARD UNITS	00070 TURBIDITY JKSN JTU	00095 CONDUCTVY @ 25 C UG/L	00620 NITRATE T NO3-N MG/L	00615 NITRITE T NO2-N MG/L	00610 AMMONIA T NH3-N MG/L
73/08/22	1420	000	16.2	7.2	100K	40K	7.7	2.0	41000	0.21	0.00	0.03
73/08/22	1425	033	12.5	6.3	200K	40K	7.7	2.0	49000	0.28	0.00	0.03
73/09/19	1135	000	11.9	9.3	40000L	800L	7.4	26.0	560	0.12	0.02	0.05
73/10/24	1445	000	12.0	6.1	20000K	1000K	7.8	10.0	30000	0.40	0.01K	0.30
73/10/24	1450	033	11.2	6.5	400K	400K	7.7	2.0	51000	0.42	0.01K	0.03
73/11/20	1505	000	10.1	6.0	40K	20K	7.7	5.0	44000	0.33	0.00	0.03
73/11/20	1600	033	10.2	6.4	400L	20K	7.7	1.0	50000	0.22	0.00	0.03
74/04/18	0925	000	10.2	8.3	5508	68	7.5	4.0	18000	0.46	0.01	0.12
74/04/18	0930	033	7.7	8.1	308	58	7.7	3.0	26000	0.33	0.01	0.03
74/05/22	1330	000	12.0	11.3	140	38	7.9	4.0	17000	0.00	0.00	0.04
74/05/22	1335	033	8.5	8.2	158	108	7.8	8.0	27000	0.18	0.00	0.04
74/06/19	1325	000	16.5	10.4	30	58	7.8	6.0	18000	0.08	0.00	0.03
74/06/19	1330	033	13.0	8.9	60	58	7.7	4.0	26000	0.18	0.00	0.04
74/07/24	1310	000	17.1	8.8	30	1K	7.9	4.0	17000	0.14	0.02	0.03
74/07/24	1315	033	13.2	7.8	50	48	8.0	2.0	27000	0.27	0.00	0.03
74/08/26	1400	000	19.2	7.3	98	48	7.8	5.0	30000			
74/08/26	1405	033	13.9	5.9	120	88	7.7	3.0	33000			
74/09/18	1430	000	17.0	8.6	30	68	7.6	4.0	21000	0.27	0.00	0.03
74/09/18	1435	033	13.5	6.8		168	7.6	3.0	27000	0.22	0.00	0.04
74/10/16	1445	000	14.3	6.7	300	25	7.8	3.0	28000	0.32	0.00	0.03
74/10/16	1450	033	13.0	5.6	1108	108	7.8	3.0	50000	0.29	0.00	0.02
74/11/20	1355	000	13.0	7.2	0M	1506	7.6	6.0	24000	0.46	0.00	0.03
74/11/20	1400	033	12.5	6.1	550	208	7.7	3.0	45000	0.29	0.00	0.03
75/04/23	1405	000	10.0	8.6	148	1K	7.8	3.0	45000	0.18	0.00	0.00
75/04/23	1410	033	8.2	9.7	108	18	7.7	3.0	28000	0.21	0.00	0.02
75/05/21	1405	000	12.3	10.1	42	28	8.2	3.0	20000	0.05	0.00	0.00
75/05/21	1410	033	9.4	9.2	68	68	7.9	2.0	29000	0.23	0.00	0.00
75/06/18	1410	000	13.8	8.9	78	2K	7.4	5.0	15000	0.24	0.00	0.03
75/06/18	1415	033	11.0	9.4	108	28	7.6	3.0	25000	0.15	0.00	0.02
75/07/16	1335	000	14.5	8.5	38	48	7.4	5.0	25000	0.14	0.00	0.03
75/07/16	1340	033	11.5	9.0	48	108	7.8	10.0	27000	0.25	0.00	0.04
75/08/20	1345	000	15.5	8.6	708	228	7.1	6.0	17000	0.18	0.00	0.03
75/08/20	1350	033	12.0	7.9	90	306	7.6	5.0	26000	0.25	0.00	0.03
75/09/17	1410	000	14.4	8.6	20K	10K	7.9	4.0	24000	0.08	0.00	0.02
75/09/17	1415	033	12.2	7.7	308	158	7.6	4.0	29000	0.30	0.00	0.02
75/10/15	1400	000	13.2	5.4	1608	188	7.5	2.0	36000	0.33	0.00	0.04

75/10/15	1410	033	11.5	6.7	68	68	7.4	2.0	29000	0.35	0.00	0.03
75/11/19	1320	000	8.0	9.5	440	608	7.0	4.0	24000	0.46	0.01	0.04
75/11/19	1325	033	9.9	8.1	328	48	7.2	2.0	28000	0.40	0.01	0.00
76/04/21	1400	000	11.0	10.6	108	48	7.7	4.0	31000	0.36	0.00	2.10
76/04/21	1405	033	7.7	9.4	108	2K	7.6	2.0	46000	0.33	0.00	0.50
76/05/12	1325	000	13.1		58	2K	7.8	3.0	24000	0.06	0.00	0.04
76/05/12	1330	033	9.0		108	28	7.8	2.0	45000	0.23	0.00	0.03
76/09/20	1320	000	16.0	8.1		148	7.5	1.0	31000	0.21	0.00	0.03
76/09/20	1325	033	13.0	6.2		158	7.5	7.0	44000	0.23	0.00	0.03
76/10/25	1135	000	12.0	7.7		168	7.6	1.0	44000	0.29	0.00	0.11
76/10/25	1140	033	11.5	6.4		48	7.6	1.0	47000	0.29	0.00	0.04
77/04/18	1125	000	9.5	12.0	70	108	7.8	3.0	33000	0.14	0.00	0.06
77/04/18	1130	032	8.5	8.6			7.6	4.0	44000	0.33	0.00	0.11
77/05/16	1135	000	12.5		230	188	7.4	1.0	34000	0.17	0.00	0.12
77/05/16	1140	032	10.0				7.4	1.0	46000	0.28	0.00	0.18
77/06/22	1230	000	13.1	9.8	460	108	7.9	4.0	26000	0.03	0.00	0.05
77/06/22	1235	026	9.3	9.0			7.8	1.0	45000	0.25	0.00	0.00
77/07/18	1235	000	13.9	7.6	308	28	7.8	2.0	45000	0.26	0.00	0.10
77/07/18	1240	032	11.2	7.0			7.8	3.0	36000	0.30	0.00	0.08
77/08/16	1315	000	18.0	10.6	OM	74	7.9	3.0	36000	0.05	0.00	0.03
77/08/16	1320	032	12.5	6.7			7.9	140.0	45000	0.30	0.00	0.03

DATE FROM TO	TIME	DEPTH FEET	00671 DIS-ORTHO PHOSPHATE MG/L P	00665 TOTAL PHOSPHATE MG/L P	00760 SWL PBI MG/L	70305 SALINITY CONDUCTVY G/L	00078 TRANSPAR SECCHI METERS	32210 CHLOROPHL A TRICHRO UG/L
73/08/22	1420	000	0.03	0.14	14	25.0		
73/08/22	1425	033	0.03	0.06	9	28.7		
73/09/19	1135	000	0.01	0.05	5	2.3		
73/10/24	1445	000	0.02	0.05	0	23.5		
73/10/24	1450	033	0.03	0.09	0	30.7		
73/11/20	1555	000	0.01	0.04	5	27.9		
73/11/20	1600	033	0.00	0.02	5	30.9		
74/04/18	0825	000	0.01	0.05	0	20.5		
74/04/18	0930	033	0.01	0.06	0	23.6		
74/05/22	1330	000	0.00	0.03	8	19.2		
74/05/22	1335	033	0.00	0.15	0	26.5		
74/06/18	1325	000	0.00	0.03	5	18.0		
74/06/19	1330	033	0.00	0.16	3	28.0		
74/07/24	1310	000	0.00	0.02		17.0		
74/07/24	1315	033	0.00	0.07		28.0		
74/08/26	1400	000			9	17.0		
74/08/26	1405	033			9	29.0		
74/09/16	1430	000	0.07	0.08	5	26.0		
74/09/18	1435	033	0.05	0.10	0	34.0		
74/10/15	1445	000	0.02	0.10	6	27.0		
74/10/15	1450	033	0.02	0.10	3	30.0		
74/11/20	1355	000	0.00	0.04	7	26.0		
74/11/20	1400	033	0.03	0.04	5	28.7		
75/04/20	1405	000	0.05	0.05	18	25.5		
75/04/20	1410	033	0.05	0.07	9	28.0		
75/05/21	1405	000	0.02		9	18.7		
75/05/21	1410	033	0.02		0	28.6		
75/06/18	1410	000	0.02	0.02	14	15.2		
75/06/18	1415	033	0.02	0.03	0	26.7		
75/07/16	1335	000	0.17	0.17	8	18.9		
75/07/16	1340	033	0.07	0.11	7	28.7		
75/08/20	1345	000	0.04	0.06	14	18.3		
75/08/20	1350	033	0.05	0.24	9	23.5		
75/09/17	1410	000	0.01	0.07	9	23.0		
75/09/17	1415	033	0.00	0.06	0	29.7		
75/10/15	1400	000	0.08	0.10	0	27.5		
75/10/15	1410	033	0.08	0.09	0	30.0		
75/11/19	1320	000	0.06	0.11	0			

75/11/19	1325	033	0.08	0.10	5			
76/04/21	1400	000	0.02	0.08	5	13.4		
76/04/21	1405	033	0.05	0.07	9	28.6		
76/05/12	1325	000	0.01	0.04	0	14.6		
76/05/12	1330	033	0.05	0.06	0	28.1		
76/09/20	1320	000	0.03	0.06	5			
76/09/20	1325	033	0.06	0.06	18			
76/10/25	1135	000	0.09	0.10	9	28.1		
76/10/25	1140	033	0.08	0.09	0	29.7		
77/04/18	1125	000	0.04	0.06	5	20.4		
77/04/18	1130	032	0.07	0.08	0	29.2		
77/05/16	1135	000	0.09	0.11	5	20.7		
77/05/16	1140	032	0.10	0.11	5	29.3		
77/06/22	1230	000	0.04	0.07	5	16.6	2.0	19.88
77/06/22	1235	026	0.06	0.07	0	29.2		
77/07/18	1235	000	0.09	0.09	5	29.3	1.7	
77/07/18	1240	032	0.03	0.06	0	23.1		
77/08/16	1315	000	0.06	0.08	0	22.9	0.9	
77/08/16	1320	032	0.07	0.09	0	29.7		

(3) CLASS B (GOOD).

(a) General Characteristic. Water quality of this class shall meet or exceed the requirements for most uses.

(b) Characteristic Uses. Characteristic uses shall include, but are not limited to, the following:

(i) Industrial and agricultural water supply.

(ii) Fishery and wildlife habitat.

(iii) General recreation and aesthetic enjoyment (picnicking, hiking, fishing, and boating).

(iv) Stock watering.

(v) Commerce and navigation.

(vi) Shellfish reproduction and rearing, and crustacea (crabs, shrimp, etc.) harvesting.

(c) Water Quality Criteria.

(i) Fecal Coliform Organisms.

(A) Freshwater - Fecal Coliform Organisms shall not exceed a median value of 200 organisms/100 ml, with not more than 10 percent of samples exceeding 400 organisms/100 ml.

(B) Marine water - Fecal Coliform Organisms shall not exceed a median value of 100 organisms/100 ml, with not more than 10 percent of samples exceeding 200 organisms/100 ml.

(ii) Dissolved Oxygen.

(A) Freshwater - Dissolved oxygen shall exceed 6.5 mg/l or 70 percent saturation whichever is greater.

(B) Marine water - Dissolved oxygen shall exceed 5.0 mg/l or 70 percent saturation, whichever is greater, except when the natural phenomenon of upwelling occurs, natural dissolved oxygen levels can be degraded by up to 0.2 mg/l by man-caused activities.

(iii) Total Dissolved Gas - the concentration of total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(iv) Temperature - water temperatures shall not exceed 21.0° Celsius (freshwater) or 19.0° Celsius